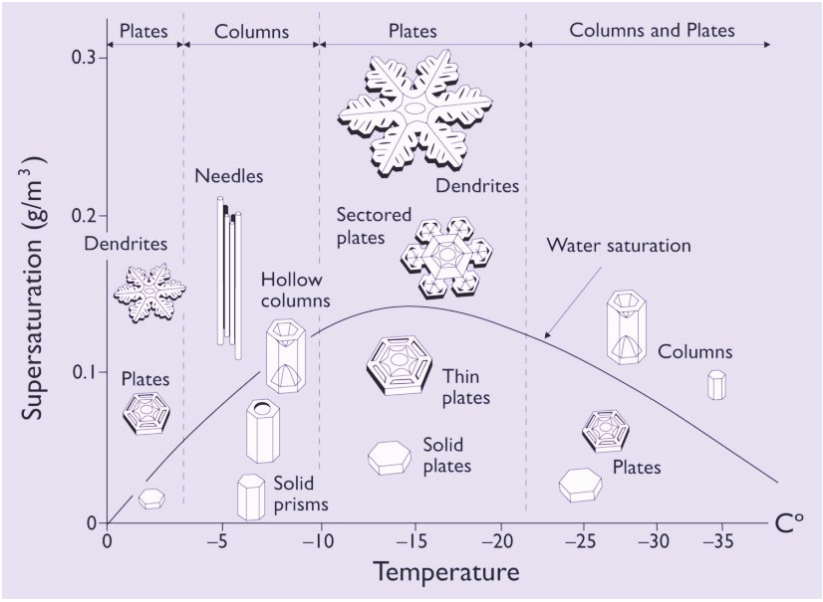
Snowflake Background Science

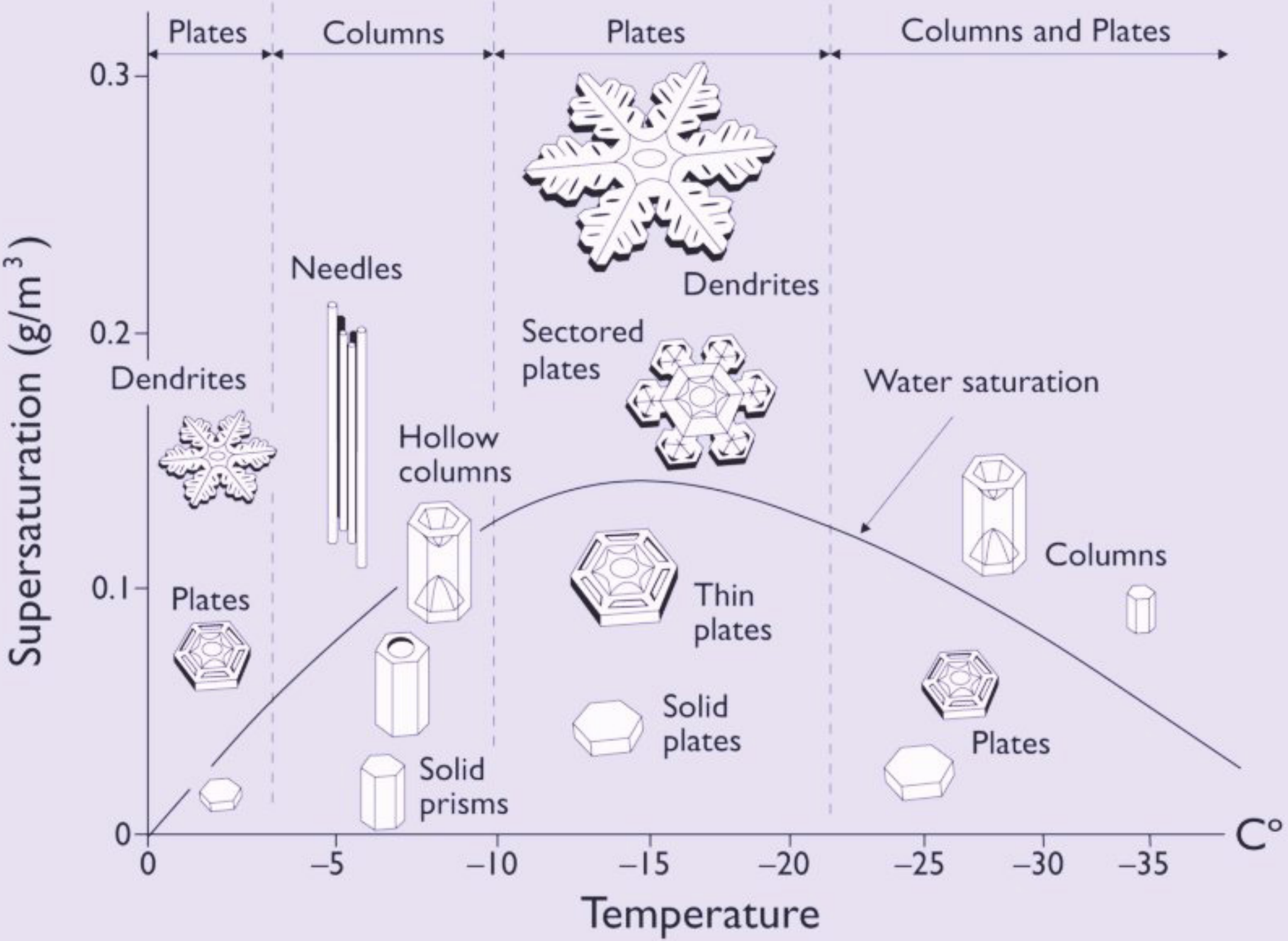
What does the shape of a snowflake tell us about snowstorms?

Water (H_2O) can exist in three phases – gas, liquid and solid. When water is in its liquid phase, we call it – water. When we add energy to liquid water (for example, by heating it), water can change into its gas phase. Sometimes we call water in its gas phase steam and sometimes we call it water vapor. When we remove energy from liquid water (for example, by cooling it in a freezer), water can change into its solid phase which we generally call ice.

The molecules of water in ice are fixed in a rigid structure known as a crystal. A crystal is a material in which the molecules are arranged in a particular order that repeats itself. Snow is simply one or more ice crystals. Although it is reasonably accurate to say that no two snowflakes are identical, snow can exist in only a few basic shapes. Those basic shapes depend upon the temperature and humidity in the region in which the snowflake formed. This diagram shows the basic crystal shapes and the temperature and humidity at which different shapes form. The humidity is on the vertical axis. It is measured in grams (g) of water per cubic meter (m^3).



Snowflakes can also change as they fall to the ground. These changes depend upon the temperature and humidity of the regions through which the flake moves. The snowflake that reaches the ground can be a combination of the basic shapes with different shapes being added at different places in the atmosphere. Scientists can learn much about atmospheric conditions by examining the shapes of snowflakes. As you will discover in the program *Snowstorm*, snowstorms in a region can come from different directions and can have different atmospheric conditions. These different conditions will help you to understand the weather in that region.


Plates
Columns
Plates
Columns and Plates
0.3
0.2
0.1
0
Supersaturation (g/m³)
Needles
Dendrites
Dendrites
Sectored plates
Water saturation
Hollow columns
Columns
Plates
Thin plates
Solid plates
Plates
Solid prisms
C°
0
–5
–10
–15
–20
–25
–30
–35
Temperature